

NATURAL ENVIRONMENT & OPEN SPACE

A Look at Blacksburg's Abundant Natural Resources

GOAL

Identify and preserve the natural resources that characterize Blacksburg and provide access to its scenic characteristics for community enjoyment by creating an open space network that retains the beauty of the natural environment and the unique feel and character of the town.

BACKGROUND

Description

Blacksburg's natural features help define its living environment. The following chapter has been categorized into five primary features: land resources; geologic features; forests, vegetation and wildlife habitat; water resources; and air quality and energy. While the existing quality of Blacksburg's environment is relatively high, the community believes it is essential to maintain and enhance this level of quality while at the same time accommodating future development.

Blacksburg's natural environment is linked to other facets of the community; therefore, other chapters in the comprehensive plan contain elements related to the natural environment. These chapters include Community Design, Utility Services, Parks and Recreation, and Greenways. In addition, the North End, Northwest, and Southwest Sector chapters also provide overviews of the town's current efforts to preserve the rural and natural character of these largely undeveloped areas.

Land Resources

Open Space planning in this region began with the development of a document entitled *Open Space Planning, An Initiative for Our Future*. This Open Space Initiative was developed jointly by Montgomery County and a citizen committee, resulting in the initiative being appended to the Blacksburg

Comprehensive Plan in June of 1994. A Greenway System Master Plan was also developed by a citizen committee and appended to the comprehensive plan by Town Council in August of 1995. These two documents have inventoried natural, cultural, historic, and general community resources targeted for preservation and



Figure NE-1, Open Space along Prices Fork

incorporation into a townwide greenway and open space network. Primary themes identified in the Open Space Initiative include:

- ◆ Conservation of Farmland
- ◆ Protection of Water Resources
- ◆ Protection of Scenic Views
- ◆ Preservation of Historic Sites and Structures
- ◆ Preservation of Rural Community and Landscape
- ◆ Identification of Recreational Locations

Open space in the Town of Blacksburg can be categorized three ways:

- (1) Privately owned open space is land associated with a farm or a home and is usually not open to public access.
- (2) Common open space is land reserved for open space in a development and is intended solely for use by that development's residents.
- (3) Publicly owned open space is land intended for use by the entire community.

All three types of open space are important and each contributes to the overall quality of life in Blacksburg. Open spaces also help to preserve and protect natural features such as groundwater recharge areas, steep slopes, and wildlife habitats. Ridgelines, hilltops, land identified in the Greenway Master Plan, land adjacent to existing public parks, to existing preserved open space or to the Creek Valley Overlay is of significant value to the community. The protection of these significant open spaces will play an important role in guiding the future of our community.

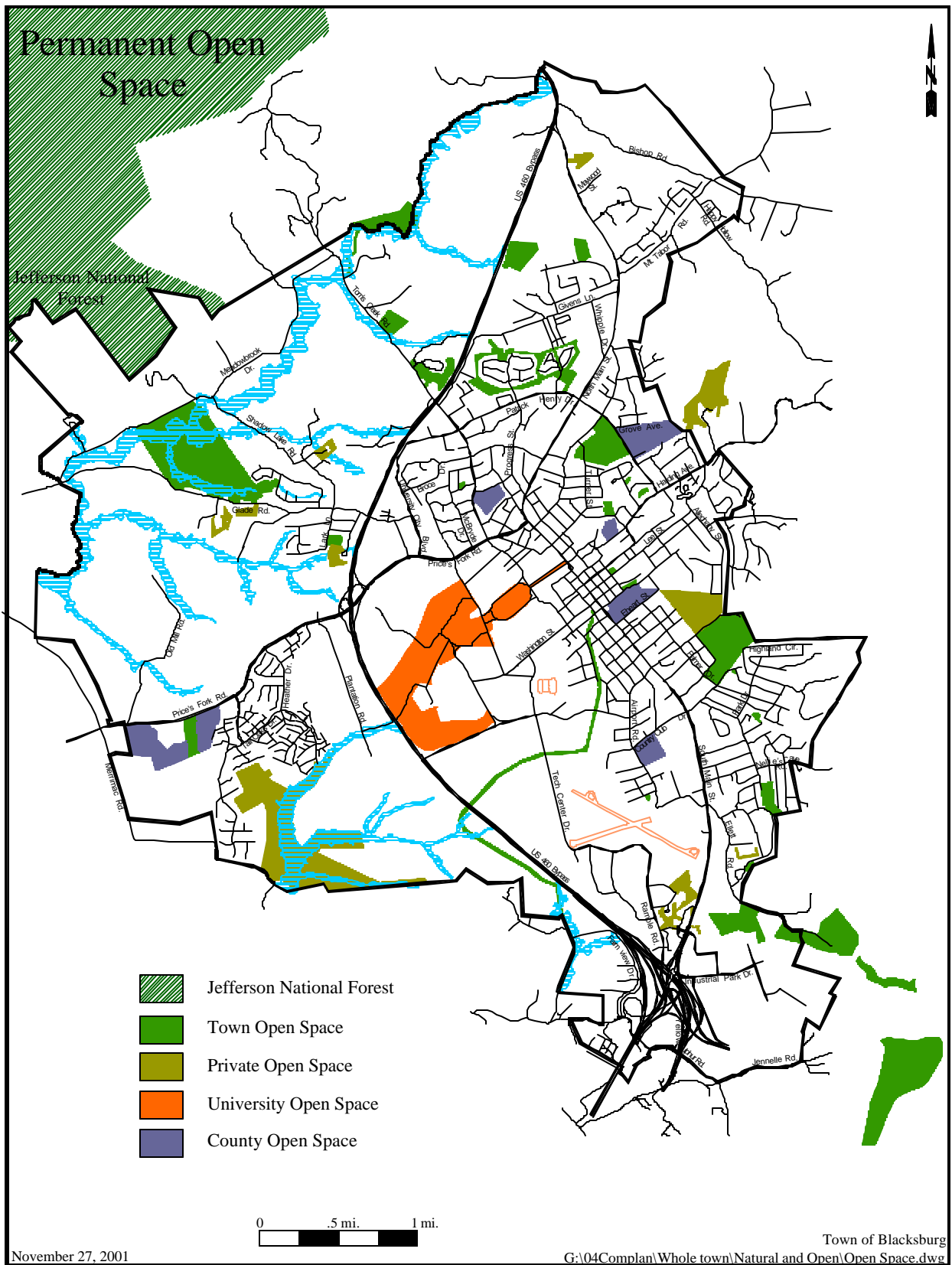


Figure NE-2, Permanent Open Space

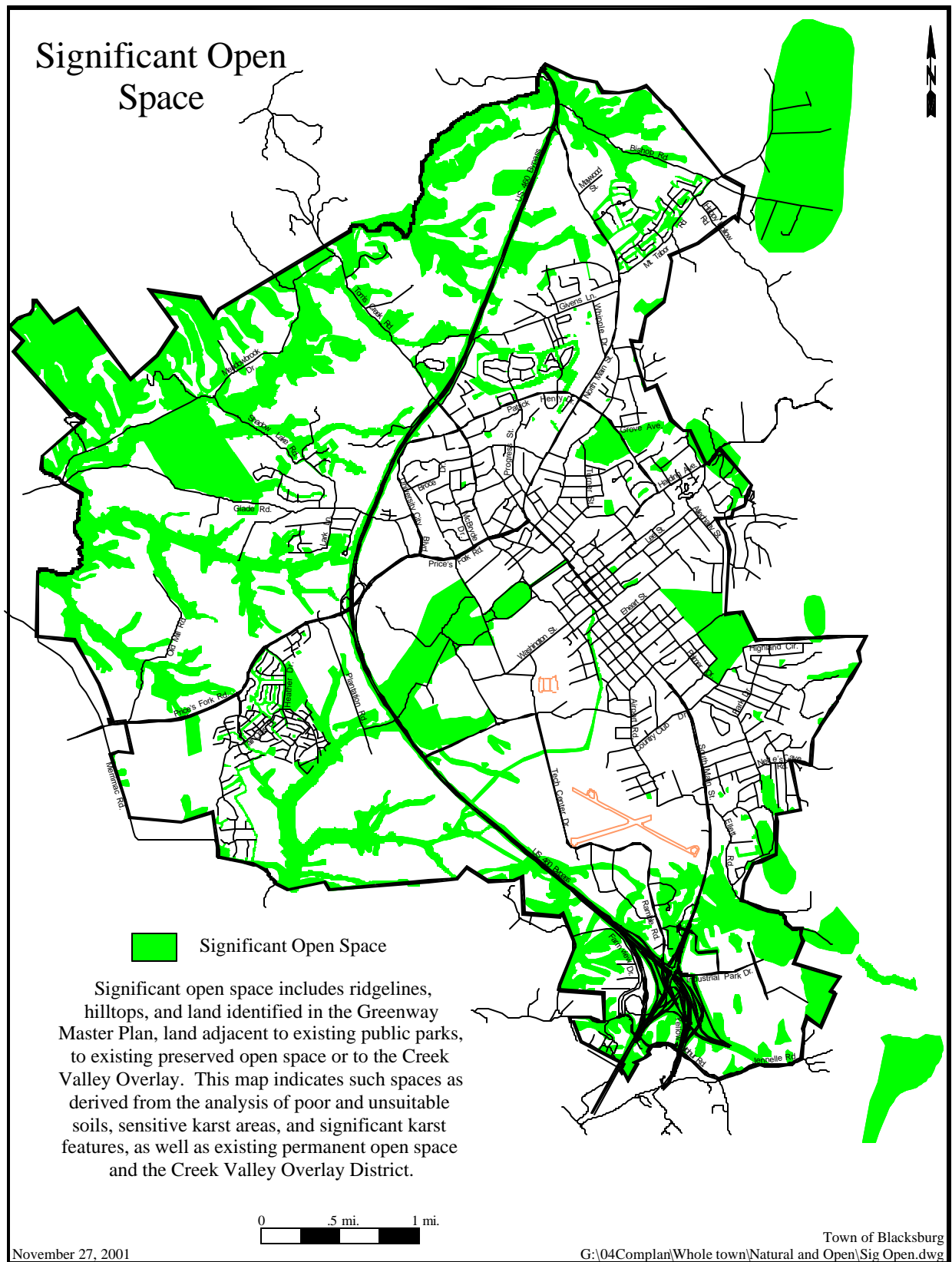


Figure NE-3, Significant Open Space

Agricultural lands provide economic value as well as contribute to the unique character of the town. According to soil suitability information (*Figure NE-6*) from Virginia Tech, approximately one-sixth of the land within the town boundaries is classified as prime agricultural land, one-third is well-suited for agriculture, and another one-sixth is moderately well-suited for agriculture.

Less than 25 percent of this land is used for agriculture. The primary challenge in preserving this valuable land use, and its associated economic and aesthetic characteristics, is the realization that land suitable for agricultural use is also suitable for urban development.

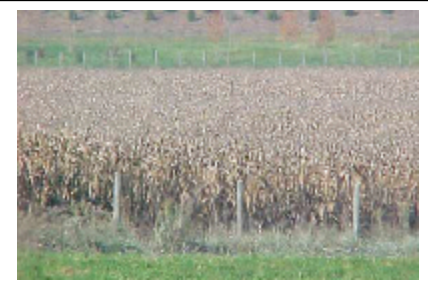


Figure NE-4, Agricultural Field

Among the tools the town uses to protect the agricultural lands within its borders is the Agricultural and Forestal District (AFD) designation. These districts were established to conserve, to protect, and to encourage the development and improvement of the Commonwealth's agricultural and forestal lands for the production of food and other agricultural and forestal products. The districts are also designed to conserve and protect agricultural and forestal lands as valued natural and ecological resources that provide essential open space for clean watershed protection, for wildlife habitat, and for aesthetic purposes. In 2001, the town had 1,977 acres of agricultural land in its Agricultural and Forestal District, which was renewed in December of 1999 to extend until June 2004. The town's Rural Residential zoning district allows one dwelling unit per acre which does not adequately protect agricultural land, but the AFD increases protection of designated land by requiring scrutiny of proposed adjacent uses.

Erosion and sedimentation, groundwater pollution, flooding, drainage problems, failed septic systems, and construction problems are all possible when soil characteristics are not considered when developing land. Blacksburg's topography includes slopes greater than seven percent, which means these areas are susceptible to soil erosion. These areas of high erosion potential do not exist in large blocks of land, but instead they are interspersed throughout Town. Also, few unsewered areas of the town are well suited for septic system drainfields. This suggests that wastewater handling may be a constraint for large-scale developments in the Tom's Creek Basin watershed unless either centralized sewer is extended to the area or a decentralized system – divided into treatment clusters according to the topography and other physical constraints – is approved by the town and used by developers. Several different decentralized sewerage options are available and could serve from ten to twenty clusters. They would average service for 100-300 houses with each residence containing septic tank effluent gravity sewer (STEG) or septic tank effluent pressure (STEP) collection systems.

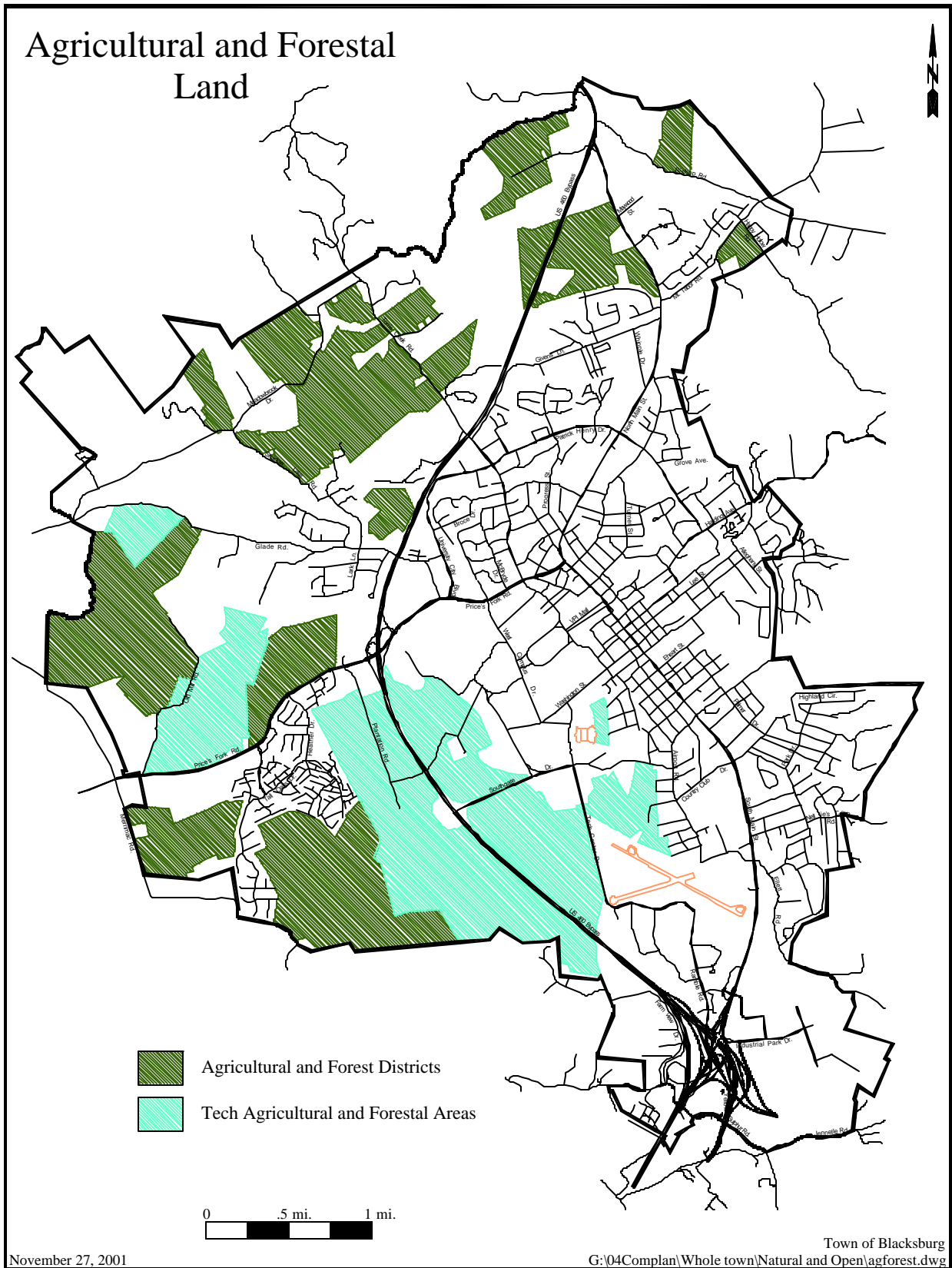


Figure NE-5, Agricultural and Forestal District

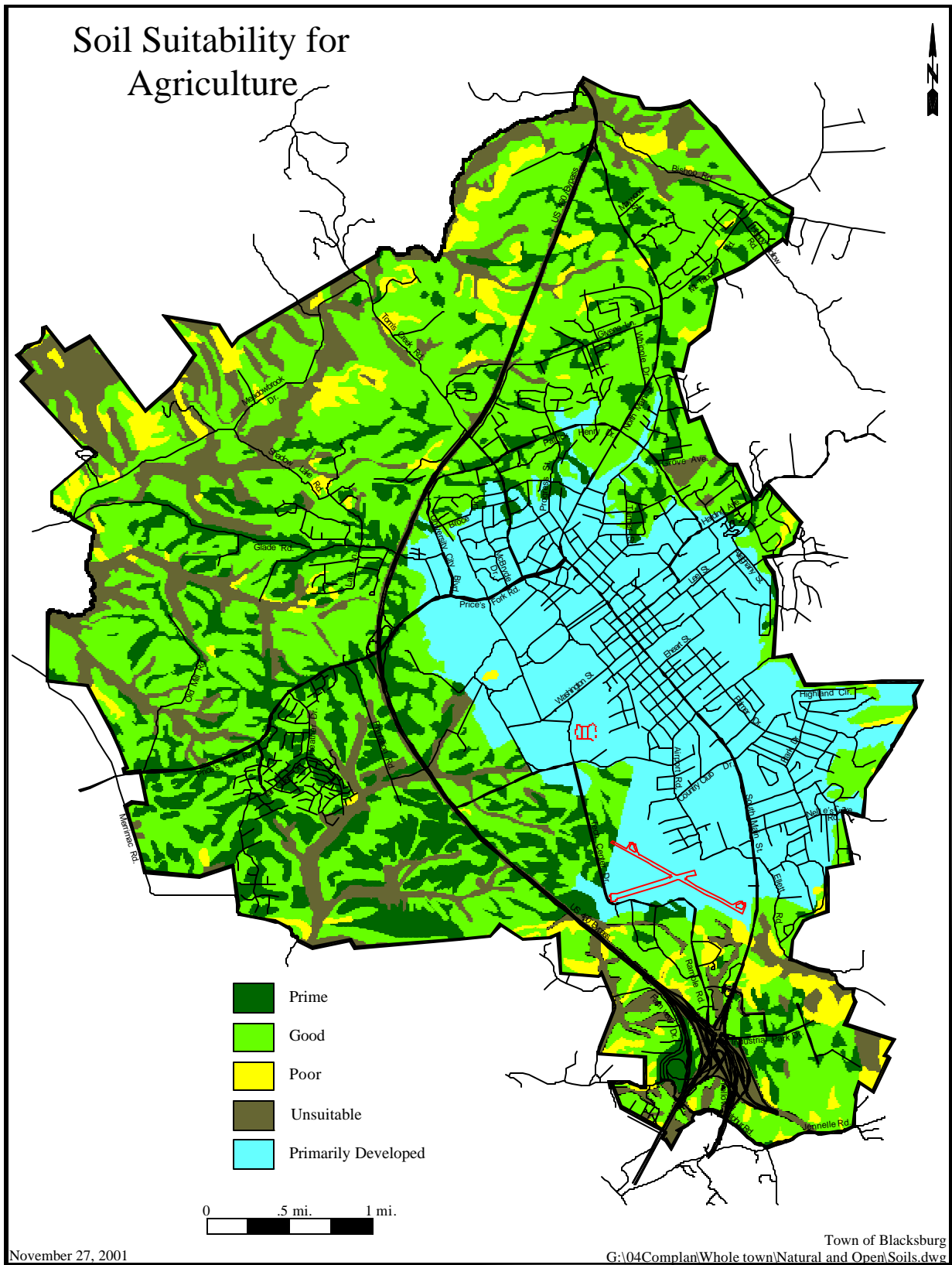


Figure NE-6, Soil Suitability for Agriculture

Geologic Features

Karst

Blacksburg's geologic features include karst terrain and steep slopes, which may pose potential hazards for development. Karst areas are underlain by soluble carbonate rock, such as limestone or dolomite, which is susceptible to dissolution and can result in sinkholes, caves, and underground streams. Although most of the town of Blacksburg overlies soluble carbonate bedrock, the degree of karst development is generally low. There are no sinking streams, and most sinkholes are broad, shallow, and stable. Eight identified karst areas have the most significant sinkhole development, and are probably the main areas of concern from a development perspective. Locations of individual sinkholes from a variety of data sources should be maintained and considered during development, but the majority of protection and monitoring efforts should concentrate on the eight sensitive karst areas. These features may pose ground stability problems for construction and potential avenues for groundwater contamination. Blacksburg is also traversed by several inactive faults, which may present another avenue for aquifer pollution (See *Figure NE-9*).¹

Radon

Radon is found all over the country, but geologic conditions in the region produce the gas at a higher than average rate for the state. Radon is a colorless, odorless gas that occurs naturally. Radon comes from the natural (radioactive) breakdown of uranium in soil, rock, and water. It can get into any type of building - homes, offices, and schools - and build up to high levels.

Radon is estimated to cause thousands of deaths each year from lung cancer. Testing is the only way to evaluate the risk from radon in individual homes or businesses. The [Environmental Protection Agency \(EPA\)](#) and the Surgeon General recommend testing all homes, below the third floor, for radon. The EPA also recommends testing in schools.

Testing is inexpensive, easy, and only takes a few minutes. The EPA recommends a follow-up test before seeking mitigation by a professional. Radon levels fluctuate naturally and it is important to know if the initial test was an accurate assessment of your home's average radon level or whether the high levels could have been caused by unusual weather. If you wish to hire a professional contact the [state radon office](#) for a state listing of qualified individuals.

¹ Natural Heritage Program, Virginia Department of Conservation and Recreation, 2001.

Topography

Despite its location in the mountains, much of Blacksburg's land is relatively flat. The older, settled parts of town have slopes of five percent or less. Approximately 90 percent of the remaining area has between five and 15 percent slope. Throughout the Tom's Creek Basin watershed and east of Town down to the Ellett Valley, slopes often exceed 15 percent. Additionally, there are some very steeply sloping lands along the sides of Brush Mountain. These

steep slopes add to the visual character of the community; however, development on these slopes can result in erosion, landslides, increased peak stormwater flows, siltation, and sedimentation. This severe topography also provides an incentive for the construction of more environmentally sensitive clusters or large lot developments, as well as for additional open space dedications.



Figure NE-7, Steep Slopes

Minerals

Mineral resources are mined and quarried in and around Blacksburg. The most prominent quarry lies at the corporate limits near Highland Park and provides the university with Hokie Stone. A former sandstone quarry lies east of Ellett Road just inside the town's corporate limits.



Figure NE-8, Davidson Hall's Hokie Stone

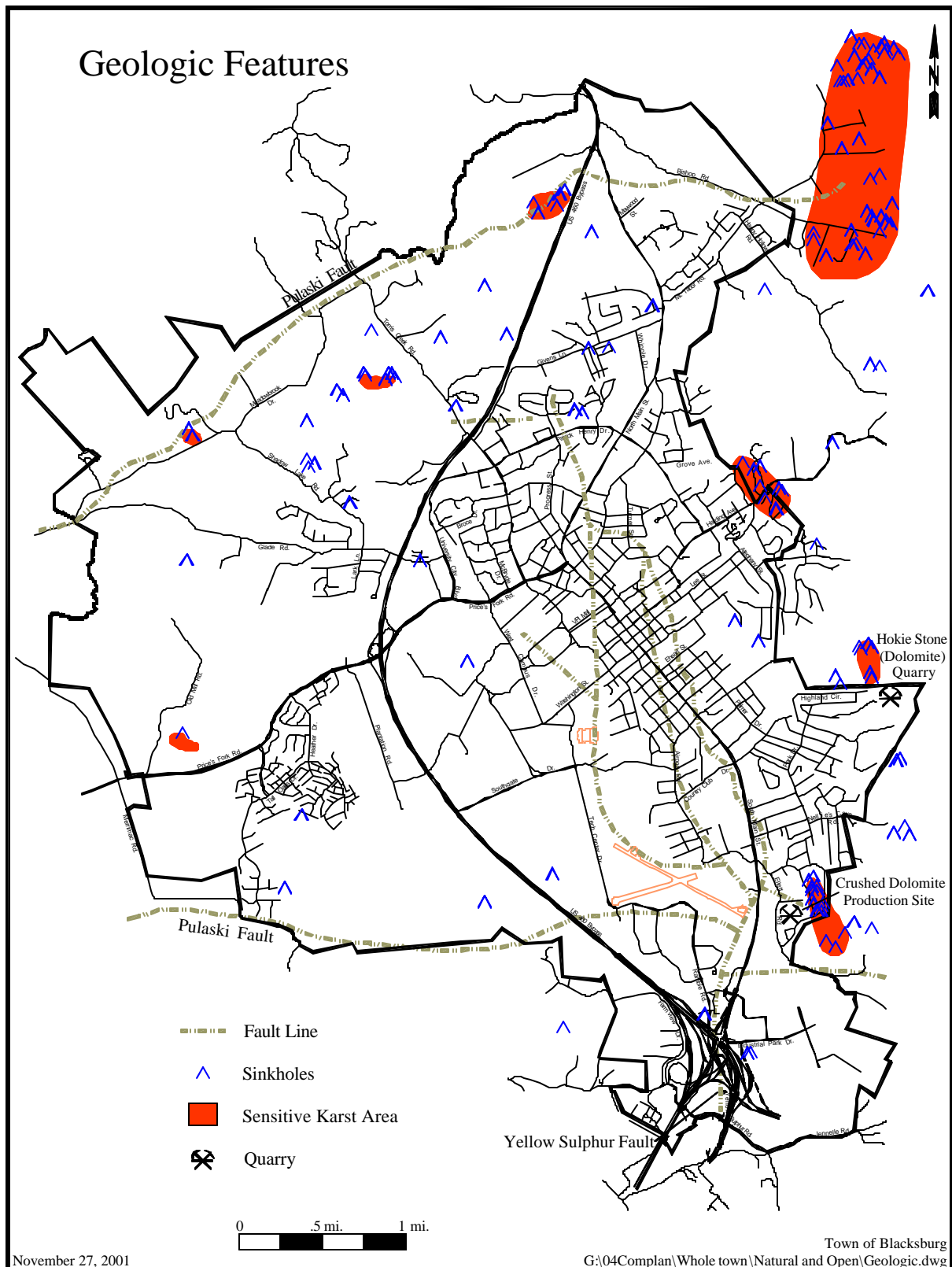


Figure NE-9, Geologic Features

Forests, Vegetation, and Wildlife Habitat

The developed portions of town have substantial tree cover, whereas the undeveloped outskirts have relatively few forested areas due to the prevalence of pastureland and other agricultural uses. The town's wooded and forested areas contribute to its visual character, help control runoff and erosion, and provide wildlife habitats. Town citizens may use Agricultural and Forestal Districts to protect forested lands, but currently no forested land is included in the town AFD. The town's Zoning Ordinance (Section 5400) addresses the landscaping and the preservation of trees, as well as planting guidelines. These requirements are the maximum allowed under state law, but only apply to new development or silviculture, and do not protect or preserve existing trees or woodlands from general tree removal.

Blacksburg's open space provides woodland and open habitats for a wide variety of plants and animals. Woodland patches are a critical source for native seeds, and provide important habitat and water quality functions. Many species and habitats, including some that require special protection, are marl-marshes, Green and Great Blue Herons, Loggerhead Shrikes, and Bobcats. The smooth coneflower and Allegheny plum are also protected, and are both located along Ellett Valley Road. In addition, the area to the southwest of the Route 460 Bypass is home to an endangered species of herb called Gentian.



Figure NE-10, Woodland Habitat

Water Resources

Located on an eastern continental divide, Blacksburg has self-contained watersheds, and thus the town receives little surface runoff from outside its boundaries. The town's surface drainage consists of five major stream systems: Tom's Creek, Stroubles Creek, Slate Branch, Cedar Run, and several small tributaries of the North Fork of the Roanoke River. These stream systems all have associated floodplains. The region's groundwater is recharged at sinkholes and pervious areas, then discharged at springs and creeks. Small areas of wetlands are located within Town, such as portions of the Heth Farm located south of Prices Fork Road adjacent to Hethwood. Problems, which can result from poor protection of these water resources, include excessive stormwater runoff, flooding, other non-point source pollution, and habitat destruction.



Figure NE-11, Stroubles Creek

Stroubles Creek, for example, has been listed by the Department of Environmental Quality (DEQ) as "severely impaired" for biological activity. The sources of the problem are identified as non-point source locations such as agricultural farms and erosion. Local environmental groups, DEQ, and Virginia Tech have initiated corrective measures, including monitoring and constructing water quality ponds. In addition, the town's Creek Valley Overlay District protects the riparian corridors which are most susceptible to soil erosion and runoff in Tom's Creek, Stroubles Creek, and Slate Branch; these are susceptible because they are adjacent to steep slopes or have other sensitive environmental conditions. The town Zoning Ordinance identifies all other areas of Town draining 100 acres or more as a Flood Hazard Overlay area where development and activities in a floodplain are restricted to protect riparian corridors.

Non-point source pollution also results from stormwater runoff flushing pollutants from land surfaces directly into natural water bodies. The town adopted the Erosion and Sediment Control Ordinance with strict regulations to address stormwater drainage and non-point source pollution created by new development.² Any development in excess of 5,000 square feet is required to submit an erosion and sediment control plan. A stormwater management ordinance is also enforced, although this is not required under state law. A stormwater control utility is a local tax, allowed under state law, that is assessed to individual property owners based on the square feet of impervious surface on their land. Revenue generated from this tax is dedicated to improving regional stormwater controls, such as regional retention ponds (e.g., dry or wet ponds). Blacksburg does not have a stormwater control utility.

Zoning in the Tom's Creek Basin area has utilized clustering with density bonuses to protect larger areas of open space. Environmentally, this development scenario in the long term will help to reduce the impacts of erosion, sedimentation, and quantity of stormwater runoff.

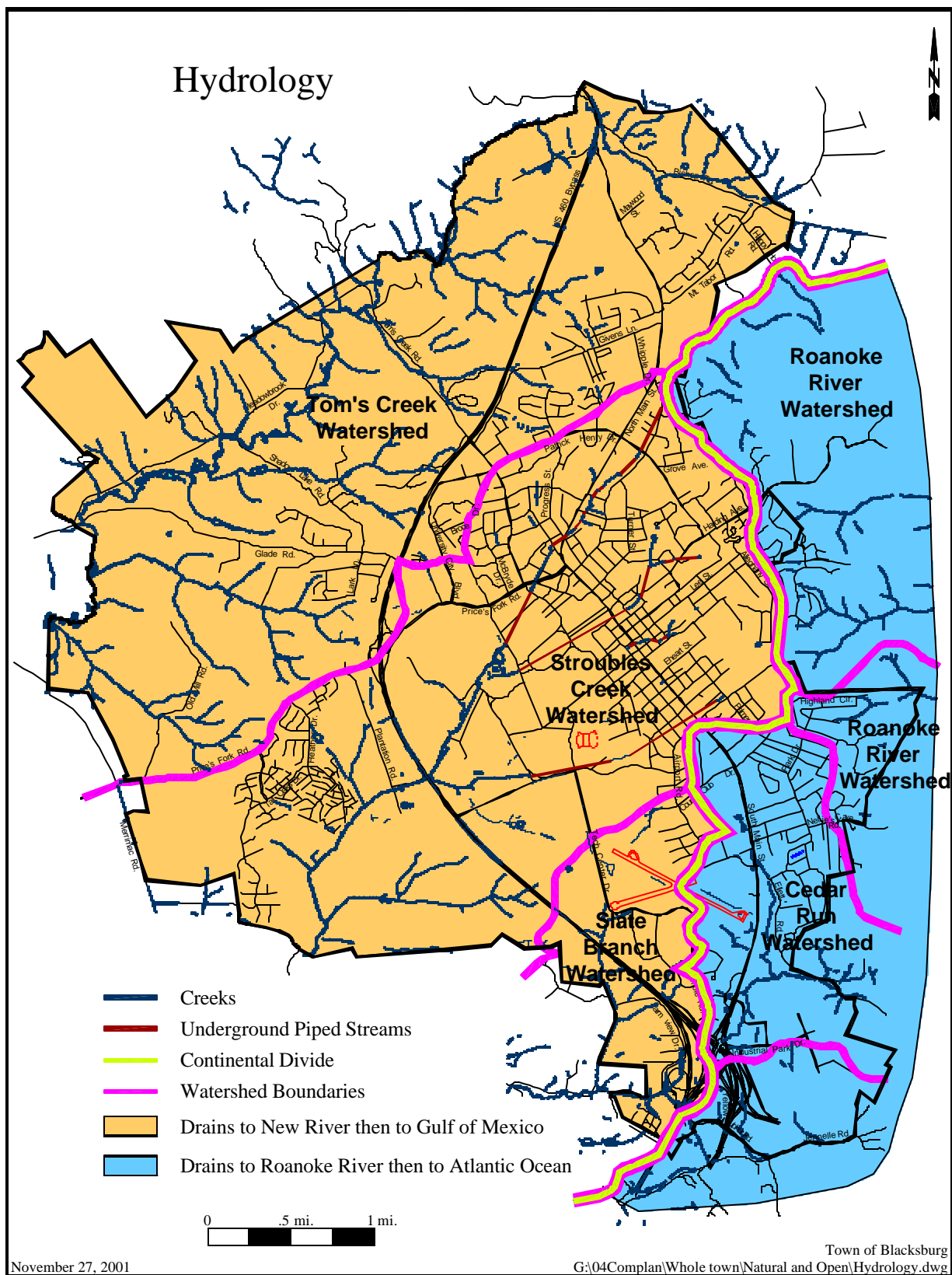
The town experiences two types of flooding hazards. One type of flooding occurs in natural floodplains running along Tom's Creek, Stroubles Creek, and Cedar Run. To mitigate flooding in these areas, the town complies with the Federal Emergency Management Agency (FEMA) National Flood Insurance Program by restricting land use in this zone. The town has adopted a Creek Valley Overlay District, which includes the entire 100-year flood plain as well as slopes greater than 25 percent within the floodplain or land within 50 feet of the stream, whichever the greater distance. One hundred year floodplains are also protected in the Flood Hazard Overlay area in the remainder of Town. Additionally, the town has created a regional stormwater management plan for the Stroubles Creek watershed that identifies seven future detention areas for the town to reduce stormwater flows. A Tom's Creek watershed management plan should be completed in the next five years to address stormwater runoff caused by development.

² Code of the Town of Blacksburg, Section 10-100, 2001.

The second type of flooding occurs during severe storm events in urbanized areas, especially in portions of Stroubles Creek basin in the vicinity of Downtown and the Virginia Tech campus. This is partially attributed to the covering of the floodplain and main creek channel with building construction, which constrains flow and infiltration. It is exacerbated by basin development, which increases impervious areas and results in additional runoff. Current stormwater drainage and detention systems are designed for a statistical storm frequency occurring once every two and ten years on new development. However, larger storms result in yard, street, and sometimes structural flooding. Existing development in the Stroubles Creek watershed, which is highly urban, is planned to drain to one of the seven stormwater management facilities planned in the 1998 regional stormwater management study. The advantage of a regional management plan for a watershed is that it allows the town to strategically plan stormwater detention areas to best benefit the watershed on the whole, rather than piece by piece as the land develops.

The town's current floodplain policy is to retain floodplains in their natural state, to mitigate flooding, to protect water quality, and to provide for open space and wetland habitats. In addition, the floodplains and stream valleys form the spine of the town's proposed greenway system, discussed further in the Greenways chapter of this document. Where the natural floodplain no longer exists and reestablishing it would be detrimental to the town, the current floodplain policy is to avoid restricting the floodway so as to avoid increasing flood levels, and to require flood proofing of all spaces below flood level. This is the case in the historic downtown and the university area.

Groundwater is used only minimally as a drinking water source within Town limits. These areas consist of Old Mill Road and a small section of Bishop Road. The town does impact regional groundwater aquifers outside of its limits, however, through land use activities near sinkholes and other recharge areas.



Air Quality and Energy

Blacksburg's air quality is a major asset to the environment and scenic beauty of the town. The Environmental Protection Agency establishes standards monitored by the Department of Environmental Quality, which determine whether a region is an "air quality attainment area" or not. Blacksburg lies within a region that achieves this designation. The air quality meets a specified standard, but is not measured against itself from sample to sample. Because there are no air quality comparisons, trends cannot be established. Those areas that do not achieve designation as an air quality attainment area are required to design a plan and to take steps to improve air quality.

Air pollutants that do exist come primarily from the combustion of fossil fuels from stationary and mobile sources, originating not only locally, but also from other areas. The Virginia Tech coal-fired boilers and motor vehicle emissions from the Route 460 corridor are the major local sources. Planting appropriate trees species throughout this corridor is a good way to mitigate the effects of automobile emissions.

The best way to maintain and enhance Blacksburg's air quality and to conserve resources is to reduce energy use, thus decreasing fossil fuel combustion and air pollutant emissions. Advancement of the community as an energy efficient model will not only lessen energy consumption locally, but will also encourage surrounding communities to conserve, which will lead to a reduction of migratory pollutants.

Transportation accounts for most of the total end use energy consumed in Blacksburg. The town can improve its transportation energy efficiency and reduce pollutant emissions with its transit system, a reasonably compact development pattern, and by expanding the greenway, bikeway, and walkway system.



Figure NE-13, BT stop

Virginia Tech could make a profound impact on the community's air quality by limiting the number of vehicles registered to legally park on campus, particularly for freshman and sophomores. An increase in student parking fees could also help to subsidize the expansion of walkways, bikeways, and transit system that allow for easy transportation throughout campus.

Energy consumed by buildings, both residential and commercial, accounts for another main section of the town's end use energy. Improving the efficiency of both new and existing buildings provides an opportunity for increased energy efficiency. American Electric Power Company is currently experimenting with demand side management (DSM) programs, designed to reduce customers' energy

use through the use of efficiency-improving devices. Virginia Tech Electric does not currently utilize DSM. Finally, land use patterns that are properly oriented, maximize infill, cluster, and employ mixed-use development can enhance the usage of natural heating and cooling and reduce residents' transportation energy needs.



Figure NE-14, Virginia Tech Power Plant

Opportunities

- ◆ The exceptionally beautiful natural environment in the region including the mountains, agricultural land, water resources such as the Spout Spring, and natural ridge and valley habitats largely defines Blacksburg's character.
- ◆ Blacksburg's citizens are dedicated to preserving the town's natural environment and open space, as well as conserving energy and resources.
- ◆ Town residents have easy access to the George Washington-Jefferson National Forest, the New River, and open spaces on the Virginia Tech campus.
- ◆ Large areas of open space and agricultural land still exist within the town limits.
- ◆ The Creek Valley Overlay and Flood Hazard Overlay districts protect surface water and riparian resources in the Tom's Creek Basin watershed and other areas of Town, as appropriate.
- ◆ The New River provides high quality, and a continuous quantity of, drinking water.
- ◆ The town has made considerable progress in planning and managing the natural environment through data inventories, open space/greenway planning, and comprehensive stormwater planning.
- ◆ The town receives little storm runoff from outside the jurisdiction because of its location along the continental divide, and the town can control runoff impacts and water quality within its own storm drainage system.
- ◆ The town, in cooperation with Virginia Tech, has a regional stormwater management plan as allowed under State Law, and the town has effectively and aggressively implemented the State's Erosion and Sediment Control Law.
- ◆ Agricultural and Forestal Districts are a useful land preservation tool. Town Council renewed it in December 1999 for four years.
- ◆ Blacksburg's transit and bikeway system, compact development patterns, and curbside recycling program increase the chances for the town to become a model energy efficient community.

Challenges

- ◆ The town faces considerable growth potential and needs to develop ways to accommodate future development while enhancing and preserving environmental quality.
- ◆ Strict growth controls in Town may force development pressures to construct on sensitive lands at the town's perimeter.
- ◆ There are limits on public funding, which restricts the ability to react quickly in land purchase situations. Prime sites will be lost if money for acquisition is unavailable when the properties go up for sale.
- ◆ The quality of existing open spaces is threatened by adjacent properties with more intensive uses.
- ◆ Conflicts exist between landowner rights and preservation interests.
- ◆ Farming operations are becoming less economically viable, forcing landowners to develop their land.
- ◆ Many owners of large tracts of land are aging. When such properties are passed on, many are divided up or developed by surviving family members.
- ◆ Creating a unified multi-jurisdictional stormwater plan that includes Blacksburg, Virginia Tech, Christiansburg, and Montgomery County.
- ◆ Floodplain mapping for Stroubles Creek, Cedar Run, Slate Branch, and Tom's Creek basin is current, although not yet approved by FEMA for the National Floodplain Insurance program.
- ◆ A potential threat to local water quality is non-point source pollution from agricultural and urban sources within the town.
- ◆ Parts of Stroubles Creek have been covered by development that eliminates its environmental and visual amenities, constrains stormwater drainage, and creates a flooding hazard that has already been exacerbated by upstream development.
- ◆ Development around sensitive karst terrain will have a negative impact on the region's groundwater.
- ◆ Energy consumption, including Virginia Tech's coal-fired boilers and increased traffic along the Route 460 corridor, affects Blacksburg's air quality.
- ◆ Air, land, light, noise, and water pollution all continue to deteriorate with the expansion of university, residential, and commercial areas.



What is Changing

Land Resources

As development pressures increase in Blacksburg, more open spaces and agricultural areas will be lost unless they are included as features in developments, or unless they are protected. Public support for preservation of open space is growing and many citizens have expressed their willingness to take steps to maintain the open space on their properties. Public awareness of the value of open space is illustrated by recent citizen participation in a joint regional open space planning effort led by both the Town of Blacksburg and Montgomery County.

Water Resources

The Town of Blacksburg, in partnership with Virginia Tech, has completed a study that identifies seven stormwater management facilities in Town that can be constructed to reduce runoff within Town and on campus. These locations are shown below in *Figure NE-16*. As a result of the study, a complete update of the storm drainage inventory was completed and modeled. This resource will help to prevent future, and to mitigate current, flooding of urbanized areas.

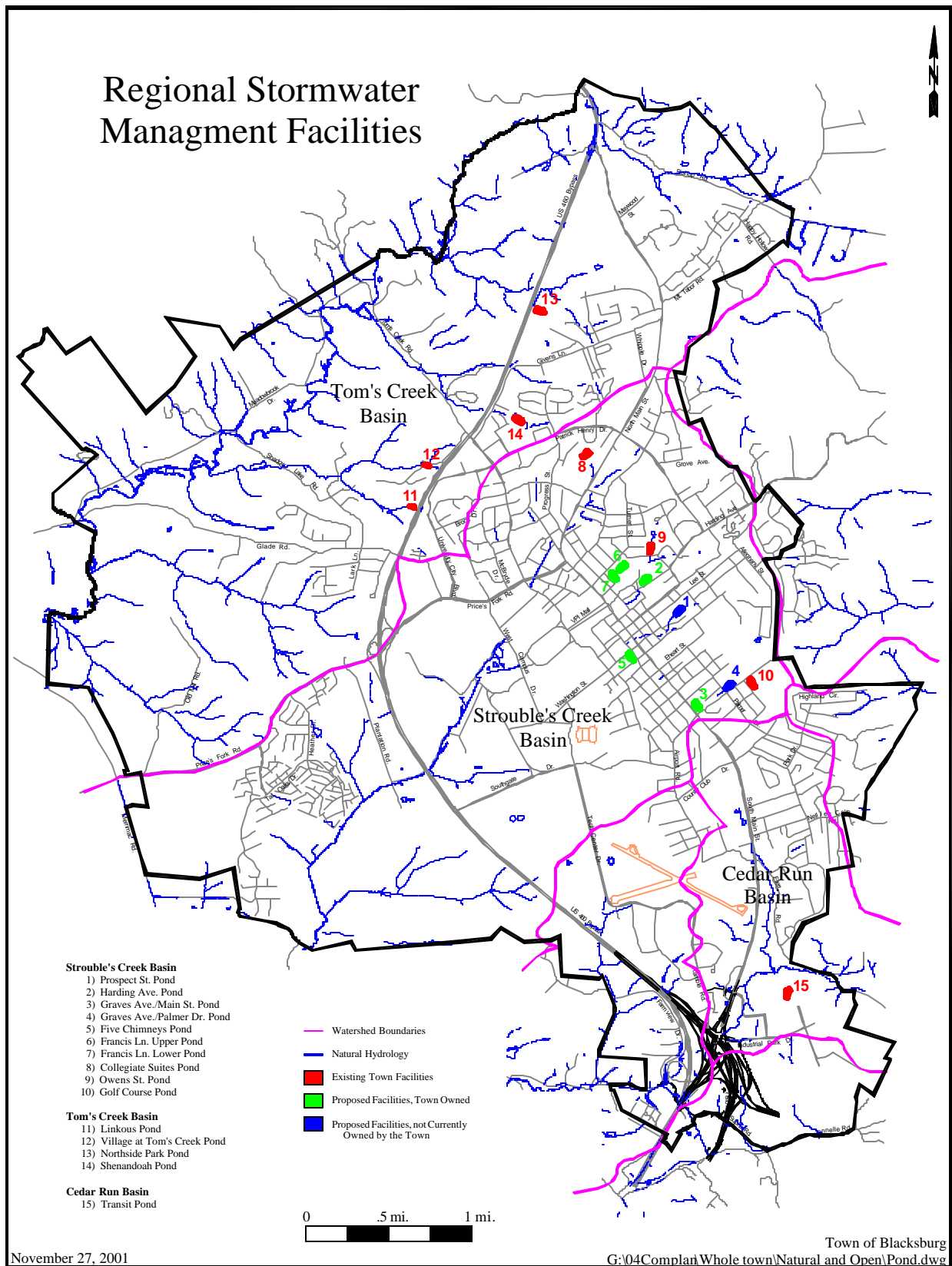


Figure NE-16, Planned Regional Stormwater Management Facilities

GENERAL POLICIES

- ❑ Protect the region's scenic views, rural-community atmosphere, and natural character by preserving large areas of open space throughout Town.
- ❑ Work with Montgomery County, the United States Forest Service, American Electric Power, public water authorities, telephone companies, and other utilities to protect ridgelines identified as important visual resources from unnecessary clear-cut timbering, utility placement, and other highly visible landscape-marring activities.
- ❑ Conserve and protect networks and corridors of natural vegetation, forest cover, wildlife habitat, and undeveloped steep slopes.
- ❑ Preserve and enhance all streams, wetlands, floodplains, and other water features such as Stroubles Creek, Tom's Creek, and the Virginia Tech Duck Pond, and incorporate them into the greenway system.
- ❑ Minimize groundwater, drainage, and structural impacts near sensitive karst areas.
- ❑ Minimize the potential for runoff problems, soil erosion, and flooding through appropriate innovative approaches to stormwater management.
- ❑ Promote innovative land use management and building techniques in the region to enhance and preserve the natural environment and utilize energy efficiently, while also accommodating for future development. Techniques may include infill and cluster developments, enhanced use of bikeways and sidewalks, environmentally friendly lighting, and public transportation.
- ❑ Encourage both private and public efforts to preserve agricultural and open lands through land trusts, open space easements, and fee simple acquisition.
- ❑ Utilize Planned Residential and Rural Residential zoning as an open space preservation technique, and continue to educate the public on the benefits.
- ❑ Encourage energy efficiency throughout the community.

ACTION STRATEGIES

in general

- Promote the continuing use of E-government and the Blacksburg Electronic Village for telecommunications, teleconferences, information processing, and working at home.
- Ensure the proper management of open space, agricultural, and forested areas.
- Protect the natural course and flow of streams as a first priority by suggesting alternatives to stream channeling and piping.
- Recognize the town's regional natural resource relationships with the surrounding jurisdictions and emphasize collaborative planning and communications between these jurisdictions including Virginia Tech, Montgomery and Giles County, Christiansburg, and the U.S. Forest Service.
- Encourage landowners to preserve forested land using Agricultural and Forestal Districts (AFDs), conservation easements, and other voluntary means for preserving environmental quality while retaining the land as an economic resource, such as the tax benefits of the Virginia Conservation Easement Act and the Act for Special Assessment for Land Use Preservation. Provide other incentives for landowners to preserve open space and to continue farming operations.
- Aggressively utilize Capital Improvement Program (CIP) land banking funds to purchase high priority open spaces (e.g., parks, greenways, dry or wet ponds for storm water detention, etc.) where dedication through development is unlikely.
- Creative financing options are needed to effectively preserve open space. The town encourages cluster housing as one means of providing quality housing for young families, professionals, and empty-nesters while also providing for additional open space. Other revenue generating proposals are encouraged as a means to finance additional public and private recreational areas.
- Direct infill onto vacant parcels in the developed portions of town, where suitable, to reduce transportation energy requirements associated with sprawl development.
- Coordinate development of the greenway system with area stormwater management as part of a regional stormwater management program.
- Avoid use of septic systems and discourage use of fertilizers, pesticides, herbicides, and other chemicals in areas of sensitive karst terrain where it can increase the likelihood of surface or groundwater contamination (See *Figure NE-9*).

- During the site plan review process, encourage developers and designers to incorporate energy-efficient design, environmental lighting, and mass transit provisions in commercial and residential developments.
- Require that every rezoning request and development plan identify any open space, mineral, or other natural or cultural resource shown by maps available or observed through field inspection. Submissions should include measures that will mitigate disturbance to these resources, and these measures should be described graphically and in text descriptions.
- Ensure that subdivision of any land respects adjacent or effected open space features, and plan for connections to open spaces within and outside of the subdivision.
- Protect farm and forest landowners from conflicting adjacent land uses.
- Encourage the use of solar, wind, and other decentralized energy technologies.

within 5 years

- Complete a regional stormwater management study in the Tom's Creek Basin to address flooding and non-point source pollution from future development.
- Establish a townwide stormwater quantity and quality plan (in accordance with the upcoming National Pollutant Discharge Elimination System Phase II Stormwater Regulations) that will include public education and outreach on stormwater impacts, public participation, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management, and pollution prevention for municipal operations.
- Acquire remaining properties for the planned regional stormwater management system (See *Figure NE-16*).
- Encourage Virginia Tech Electric and American Electric Power (AEP) to implement Demand Side Management programs, and to use Blacksburg as a test community.
- Support the utilization of a locally operated, regional land trust to serve Southwestern Virginia localities. The organization should be nonprofit, independent of local government, and capable of holding perpetual conservation easements.
- Encourage Virginia Tech to limit the number of students who are allowed to bring vehicles to school, and urge local employers to establish car-pooling incentives to minimize one-occupant auto travel.
- Implement land use taxation programs for other categories of open space, such as for scenic and historic areas as permitted by state code, and similar to the existing agricultural land use taxation program.

- Continue to develop an environmental and land use database with mapping to support environmental planning and development, and to monitor impacts on environmental resources. This database should include a model of the regional environmental functions so that the town can work better with surrounding jurisdictions.
- Work with Virginia Tech, the Virginia Natural Heritage program, and other groups to acquire up-to-date information about wildlife habitats within the town's borders, to include endangered and threatened species, and species of special concern.
- Document features of the natural environment such as wildlife and habitats, covered streams, and water quality, in order to incorporate them into a comprehensive natural environment database that can be used in a Geographic Information System (GIS). Use GIS to evaluate and analyze existing resources in the town.
- Study the area's subsurface relationship between geology and groundwater to aid in developing future protection measures and monitoring techniques, and identify karst areas that pose a threat to subsurface contamination.
- Educate the public about the vulnerability of groundwater in sensitive karst terrain in cooperation with the Virginia Cooperative Extension Service.
- Protect the natural course and flow of existing streams as a first priority by suggesting alternatives, such as urban Best Management Practices (BMPs), to stream channeling and piping. An example of an urban BMP is the riparian forest buffer system used along Chesapeake Bay tributaries.
- Maintain drainage channels in their natural state and stabilize or un-pipe such channels to protect the drainage systems from development impacts in areas of 15 percent slope or greater.
- Develop a regional stormwater management approach through the cooperation of the town, Virginia Tech, Montgomery County, and other landowners.
- Adopt stormwater management techniques, such as vegetative swales, that are not only effective on-site control measures, but are also aesthetically pleasing. Address the one, two, ten, or 25-year storms when appropriate.
- Establish and follow construction standards for the greenway system that minimize the potential impacts of flooding and erosion.
- Increase the emphasis in town zoning ordinances regarding enhancing the natural environment through development. A sketchbook of design principles should be developed for the town along with a site plan ordinance.
- Educate the public on energy saving household practices.
- Allow flexibility in yard and setback requirements and in street layout to take advantage of proper orientation and climate factors for energy efficiency.

- Implement alternative ways to minimize impervious surfaces through cluster developments and urban landscaping. In addition, consider use of porous pavements where appropriate in new construction and in renovation of existing parking lots and streets throughout Blacksburg.
- Encourage compact/mixed use development to allow opportunities for citizens to perform daily tasks without needing to drive to their destinations.
- Work with property owners to develop conservation easements and other voluntary techniques to preserve land and habitats.
- Require that landowners whose properties receive land use assessment taxation or agricultural and forestal district designation to implement best management practices on all lands in either program.
- Construct Prospect Street, Harding Avenue, and Graves Avenue stormwater management facilities as identified in the Stormwater Management Pond Study for Donaldson Brown; encourage cooperation from Virginia Tech.

within 25 years

- Set an example for the private sector by using alternatively fueled vehicles in the municipal fleet.
- Acquire land, easements, or utilize other conservation measures along the entire length of Tom's Creek to create a large greenway.
- Encourage the provision of greenway linkages from the central greenway along Tom's Creek to the rest of the basin and to other areas of Town as properties are developed.
- Apply for state and federal funds to rehabilitate and to restore degraded wetland areas townwide as identified in the natural environment database.
- Establish no net gain sedimentation standards for new developments by requiring Best Management Practices (BMPs).
- Uncover piped urban streams where appropriate.
- Evaluate alternatives to the Agricultural and Forestal districts as a tool to preserve agricultural land and open space.
- Install a program for the periodic testing of air quality to monitor progress.
- Consider congestion mitigation measures now mandated in non-attainment areas to maintain the high level of air quality.
- Modify the existing land use taxation programs to include the forest and open space components allowed by the current *Code of Virginia*. Applicants applying for land use taxation under the open space provisions should own property having resources identified by the open space maps.

- Require both public and private development proposals to identify environmental constraints and opportunities, and to demonstrate how environmental impacts will be mitigated.
- Develop a management system for conservation easements either through an existing land trust, a public entity, or directly through the town.
- Consider a partnership arrangement to include the municipality and future developers in the sharing of costs to install necessary off-site infrastructure where off-site costs would otherwise be borne solely by the developer, as a means to direct growth to desired areas, and to retain open spaces.
- Design guidelines for timber management including harvesting and reforestation.
- Prohibit development on all slopes exceeding 25 percent.
- Lobby for more stringent energy efficient building codes statewide.
- Consider density bonuses to encourage designs that provide solar access and other energy saving measures.
- Encourage property owners to utilize tax assessment abatement programs for installation of renewable energy systems in their houses.
- Complete a stormwater management study in each of Blacksburg's watersheds to identify runoff problems and areas available for acquisition to construct stormwater ponds.
- Complete the Stroubles Creek stormwater management facilities identified in the Stormwater Management Pond Study for Donaldson Brown: Graves Avenue/Palmer Drive, Five Chimneys, and Francis Lane ponds.
- Consider implementing a Stormwater Control Utility Tax to fund regional stormwater controls and to encourage the use of pervious surfacing.

beyond 25 years

- Work with Virginia Tech to identify alternatives to their coal-fired boiler for power production.
- Retrofit developed areas through the creation and/or modification of ponds, marshes, wetlands, and other treatment systems to remove pollutants and to reduce stream channel erosion. Identify suitable areas for the adaptation of these treatment systems through preliminary engineering reports.